
ARIZONA CTE CAREER PREPARATION STANDARDS & MEASUREMENT CRITERIA

PRECISION MACHINING, 48.0500.30**STANDARD 1.0 – DESIGN A JOB PROCESS PLAN**

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| 1.1 | Develop a process plan for a part requiring milling, drilling, turning, or grinding |
| 1.2 | Fill out an operation sheet detailing the process plan, tool list, and required speeds and feeds |

STANDARD 2.0 – APPLY ENGINEERING DRAWING AND SKETCH TERMS, COMPONENTS, AND SYMBOLS

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| 2.1 | Read and interpret blueprint drawings, symbols, scales, and legends |
| 2.2 | Relate information on blueprints to actual parts |
| 2.3 | Identify and use drawing dimensions |
| 2.4 | Sketch and dimension drawings |

STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN

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| 3.1 | Use a hand drill and hand tap holes in aluminum stock |
| 3.2 | Use files, scrapers, and coated abrasives to deburr parts |
| 3.3 | Use arbor/hydraulic presses to perform press fits |
| 3.4 | Use bench vises to hold parts for assembly |
| 3.5 | Layout the location of hole centers and surfaces within an accuracy of +/- .015 inches |
| 3.6 | Set up, chuck, and carry out between centers turning operations for straight turning |
| 3.7 | Set up and perform a milling operation to square up the six surfaces of a block to within +/- .002 and .002 over 4.5 inches squareness |
| 3.8 | Set up and operate vertical milling machines with the location of the hole centers within +/- .005 inches |

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3.9	Ring test grinding wheels, perform visual safety inspection, and mount and dress a grinding wheel in preparation for surface grinding
3.10	Set up, dress the grinding wheel, and operate manual surface grinders with an 8-inch or smaller diameter wheel
3.11	Perform routine surface grinding, the location of surfaces, and the squaring of surfaces
3.12	Set up and perform routine drill press operations
3.13	Use the principles of Cartesian coordinates to develop a program for the manufacture of a simple part
3.14	Develop a program for the CNC manufacture of a simple part
3.15	Identify the differences in the capability of multi-axis CNC equipment
STANDARD 4.0 – DESIGN A MANUFACTURING PROCESS FOR A NEW MACHINED PRODUCT	
4.1	Identify potential machining processes for a new product
4.2	Establish criteria for determining optimal machining process
4.3	Identify equipment for a new machining process
4.4	Prepare production documentation for a machining process
STANDARD 5.0 – IMPLEMENT PROCESS ADJUSTMENT AND IMPROVEMENT	
5.1	Analyze the performance of a single-part production process
5.2	Formulate process adjustments or improvements where appropriate
5.3	As a member of a process team, analyze the performance of a production process
5.4	With the team, formulate process adjustments or improvements where appropriate
5.5	Utilize Statistical Process Control (SPC) terminology (e.g., range, x-bar chart, order of operations, variation, mean, tolerance)

These technical knowledge and skill standards were validated by a Skill Standards Validation Committee on February 17, 2010, and used in the adaptation, adoption, and development of test items for first-time testing in Fall 2010.

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STANDARD 6.0 – PRODUCE A PRODUCT TO SATISFY CUSTOMER NEEDS	
6.1	Verify that needed resources are available for the production process
6.2	Inspect the product to verify that it meets specifications
6.3	Document product and process to ensure formal compliance with customer requirements
STANDARD 7.0 – CORRECT PROCESSES TO ENSURE THAT PRODUCTS MEET QUALITY STANDARDS	
7.1	Develop a process inspection plan
7.2	Develop a sampling plan for sample data
7.3	Verify the calibration of gauges and other data collection equipment
7.4	Inspect simple parts, applying appropriate precision measurement techniques, instruments, and gauges
7.5	Develop a process chart, and graph and interpret sample data
7.6	Make recommendations relative to production conditions indicated by the process charts
7.7	Identify closed-loop corrective action to provide ongoing production feedback
7.8	Record the process outcomes, identify the trends, and recognize the needs for improvement
7.9	Identify and report performance and training issues to assess their effect on quality
7.10	Read various precision measuring instruments (i.e., caliper, micrometer)
STANDARD 8.0 – APPLY AN ENGINEERING PROBLEM-SOLVING AND DESIGN PROCESS	
8.1	Apply a structured approach to solving problems (e.g., define a problem; brainstorm, research, and generate ideas; identify criteria and constraints; explore possibilities; make a physical, mathematical, or conceptual model; test and analyze the solution; and communicate results)
8.2	Use troubleshooting to determine why something does not perform to standard

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8.3	Examine the relationship between components of a complex product
8.4	Examine design criteria and constraints (e.g., cost, time, quality, manufacturability, testability, serviceability, human factors, environmental factors, and technology trends) as they relate to production
STANDARD 9.0 – MAINTAIN EQUIPMENT, TOOLS, AND WORKSTATIONS	
9.1	Identify the benefit of maintaining a clean, safe, and functional work/duty station
9.2	Inspect and assess the general condition of an assigned machine tool
9.3	Monitor equipment indicators to ensure correction operation
9.4	Make routine adjustments as necessary and as authorized
9.5	Carry out daily, weekly, and/or monthly routine maintenance of machine tools as cited on checklists
9.6	Inspect and assess the condition of fixtures and cutting tools
9.7	Identify worn/damaged cutting tools and repair or regrind
9.8	Identify tool and cutting lubricants and their application
9.9	Identify the protocol pertaining to inoperative/malfunctioning equipment
STANDARD 10.0 – PERFORM SAFETY AND HEALTH REQUIREMENTS FOR MAINTENANCE, INSTALLATION AND REPAIR	
10.1	Monitor equipment and operator performance to ensure workplace safety and compliance with local and national regulations
10.2	Maintain all relevant equipment operation and repair certifications
10.3	Identify and use personal protective equipment
STANDARD 11.0 – DEMONSTRATE MATHEMATICAL CONCEPTS IN MANUFACTURING	
11.1	Add, subtract, multiply, and divide whole numbers without a calculator

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11.2	Calculate fractions and decimals and perform metric conversions with or without a calculator
11.3	Apply basic geometric concepts and terminology (e.g., planes, perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity, and symmetry)
11.4	Solve for an unknown in a trade formula using standard formulas and arithmetic operations to make required calculations with or without a calculator
11.5	Solve for unknowns in right triangles with or without a calculator
11.6	Calculate means, medians, modes, and ranges with or without a calculator
11.7	Follow a set of instructions laid out in a sequence
11.8	Interpret and follow if-then instructions